What is claimed is:

1. A heterojunction structure comprising a p-type semiconductor thin film and an n-type ZnO-based nanorod epitaxially grown thereon.

2. The heterojunction structure of claim 1, wherein the p-type semiconductor is made of a material having a band-gap energy ranging from 1.5 to 4.5 eV.

3. The heterojunction structure of claim 2, wherein p-type semiconductor is made of a material selected from the group consisting of GaN, AlN, GaP, GaAs, ZnSe, CdSe, CdS, ZnS, $SrCu_2O_2$, SiC and Si.

4. The heterojunction structure of claim 1, wherein the p-type semiconductor thin film has a thickness ranging from 50 nm to 200 ㎛.

5. The heterojunction structure of claim 1, wherein the ZnO-based nanorod has a diameter in the range of 5 to 100 nm and a length in the range of 5 nm to 100 ㎛.

6. The heterojunction structure of claim 1, wherein the ZnO-based nanorod is a ZnO nanorod or a heteromaterial-doped or coated ZnO-nanorod.

7. The heterojunction structure of claim 6, wherein the heteromaterial is selected from the group consisting of Mg, Mn, Cd, Se and mixtures thereof.

8. The heterojunction structure of claim 6, wherein the doped

heteromaterial is selected from the group consisting of $Zn_{1-x}Mg_xO$ ($0<x<1$), $Zn_{1-x}Mn_xO$ ($0<x<1$), $Zn_{1-x}Cd_xO$ ($0<x<1$) and $Zn_{1-x}Se_xO$ ($0<x<1$).

9. A method for preparing the heterojunction structure of claim 1, which comprises bringing the vapors of a Zn-containing metal organic compound and an O_2-containing compound as reactants separately into contact with a p-type semiconductor thin film at a temperature in the range of 400 to 700 ℃ under a pressure in the range of 0.1 to 10 torr to form a ZnO nanorod on the surface of the semiconductor film.

10. A nano-device or an array thereof comprising the heterojunction structure of claim 1.

11. A nano-system or an integrated circuit comprising the nano-device array of claim 10.